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(54) Calcium dietary supplement

Kalziumnahrungszusatz

Complément alimentaire à base de calcium

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WO-A-90/01321
WO-A-92/02235
WO-A-92/21355
WO-A-93/05795

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Description

[0001] Mineral and vitamin compositions are routinely used as dietary supplements either as therapeutic preparations directed to a specific medical problem or as general nutritional supplements.

[0002] Calcium and trace mineral supplementation is important for adults as well as growing children. The adult population requires additional calcium to help prevent the bone loss that goes along with the normal aging process. Postmenopausal women require more calcium due to the change in their hormonal status, which can accelerate the bone loss rate leading to osteoporosis.

[0003] Osteoporosis is a prevalent condition, affecting as many as 15-20 million individuals in the United States. In osteoporosis, bone mass decreases causing bones to be more brittle, thus bones become more susceptible to fracture. It has been estimated that at least 1.3 million fractures in the U.S. are attributable to this disease [National Osteoporosis Foundation, Stand UP to Osteoporosis, Your Guide to Staying Healthy and and Independent Through Prevention and Treatment, Washington, D.C. 1992]. Many scientist believe that a chronic shortage of dietary calcium is one very important factor leading to osteoporosis. Optimal calcium intake (1000 - 1500 mg) for adults may be achieved through diet, calcium fortified foods, calcium supplements or combinations thereof. Studies that show that the usual intake of calcium for adult women in the U.S. is between 450-500 mg per day [U.S. Department of Health and Human Services, Public Health Service National Institutes of Health, Osteoporosis, Cause, Treatment Prevention, Maryland, National Institutes of Health, 1987]; this amount is well below the United States Recommended Daily Allowance (U.S. RDA). It has recently been reported that in addition to calcium, the minerals boron, copper, magnesium, manganese and zinc, play an important role in bone formation [Strause, L., *et al*: The Role of Trace Elements in Bone Metabolism, Nutritional Aspects of Osteoporosis, New York, Raven Press, p. 223-233, 1992 and Nielsen, F.: Facts and Fallacies about Boron, Nutrition Today, 27 (3): 6-12, May/June 1992). In addition, vitamin D is known to play a critical role in the absorption of calcium by the human body. The recommended daily intake of vitamin D is between 400 International Units, hereinafter called I.U., and 800 I.U. for an elderly person.

[0004] WO-A-92/02235 discloses nutritional mineral supplements comprising calcium citrate maleate and salts of manganese, copper and zinc. The supplements are useful for increasing bone growth and for treating age-related bone loss. WO-A-92/21355 teaches the incorporation of vitamin D into such supplements. WO-A-90/01321 teaches the use of 1α-Vitamin D_2 for preventing or reversing loss of bone mass or bone mineral content.

[0005] The present invention relates to a dietary supplement composition containing calcium carbonate, vitamin D and minerals. The mineral comprises compounds of boron, copper, magnesium, manganese and zinc. The composition also normally comprises pharmaceutically acceptable carriers and excipients.

DETAILED DESCRIPTION OF THE INVENTION

[0006] The invention provides a dietary supplement composition to protect against bone loss comprising:

calcium carbonate having a content of 1000 to 2500 mg; vitamin D having a content of 50 to 800 I.U.; and the following as minerals,
a boron compound having a content of 50 to 3000 micrograms;
a copper compound having content of 0.1 to 5.0 mg;
a magnesium compound having a content of 10 to 150 mg;
a manganese compound having a content of 3 to 10mg; and
a zinc compound having a content of 3 to 25mg.

[0007] Not all calcium sources are equal in terms of bioavailability and absorption. The invention uses a preferred form of calcium, namely calcium carbonate which contains the highest amount of absorbable calcium, 40% elemental calcium. Calcium carbonate Is cheap, readily available and easily compacted to make a tablet with greater calcium content. Because of the higher elemental calcium content of calcium carbonate, a tablet can be made smaller and can contain a higher concentration of available calcium. Since the tablet can be smaller, it is easier to swallow especially for elderly people.

[0008] The calcium carbonate content is within the range of 1000 mg to 2500 mg, advantageously 1500 to 2000 mg.

[0009] Vitamin D, critical in the role of calcium absorption, is added in the range between 50 I.U., and 800 I.U. The preferred range is between 200 - 400 I.U.

[0010] The mineral supplies boron, copper, magnesium, manganese and zinc. The anions for the minerals can be oxide, phosphate, chloride, sulfate, or nitrate.

[0011] Copper, zinc and magnesium are needed in bone formation and metabolism. They are essential as co-factors for several enzymes involved in organic bone matrix synthesis. The evidence from human studies demonstrates the metabolic necessity in the formation and maintenance of a healthy skeleton (Strause, L., *et al*: The Role of Trace

Elements in Bone Metabolism, Nutritional Aspects of Osteoporosis, New York, Raven Press, p. 223-233, 1992). Manganese deficiency manifests itself in impaired growth and skeletal abnormalities. In addition, magnesium is an essential constituent of all soft tissue and bone. Much of the magnesium in the body is combined with calcium and phosphate in bone (Avioli, L: Calcium and Osteoporosis, Ann. Rev. Nutr., 4:471, 1984). The lack of boron effects the composition, structure and strength of bone. The effect of boron on bone metabolism might reflect its known action on macromineral metabolism. Studies in humans strongly suggest that boron is beneficial to calcium metabolism and absorption (Nielsen, F.: Facts and Fallacies about Boron, Nutrition Today, 27 (3): 6-12, May/June 1992).

[0012] The amounts of the mineral supplements are:

boron compound from 50 to 3000 micrograms;
copper compound from 0.10 to 5.0 mg;
magnesium compound from 10 to 150 mg;
manganese compound from 3 to 10 mg; and
zinc compound from 3 to 25 mg.

As a general statement, the total weight of the dosage form is less than about 3.0 g. In the preferred embodiment the dosage form is equal to or less that about 2.0 g.

[0013] The present formulation may also include preservatives such an benzoic acid and salts thereof, butylated hydroxyanisole, butylated hydroxytoluene, sulfur dioxide and the like; food grade emulsifiers such as lecithin, mono- and diglycerides of long chain fatty acids, and propylene glycol esters; and pharmaceutically acceptable carriers and excipients, which are known to those skilled in the art.

[0014] As used herein, pharmaceutically acceptable is a component which is suitable for used in humans without undue adverse side effects, such as irritation, toxicity, and allergic response.

[0015] The present formulation may be in oral solid dosage form for example a tablet, capsule, lozenge, chewable tablet or bulk powder. The tablet, capsule or lozenge may contain suitable binders, lubricants, diluents, disintegrating agents, coloring agents, flavoring agents, flow-inducing agents and melting agents which are known to those skilled in the art.

[0016] The present formulation may also be in a liquid dosage form which includes an emulsion and suspension. The liquid dosage form may contain, for example, suitable solvents, preservatives, emulsifying agents, suspending agents, diluents, sweeteners, melting agents, and coloring and flavoring agents, which are known to skilled in the art.

[0017] It is preferred to administer the composition of the present invention in the form of tablets; however, any form of oral administration can be used.

[0018] The solid dosage form may have a film coating to protect the ingredients from moisture, oxygen or light and to mask any undesirable taste or appearance. Suitable coating agents include cellulose, hydroxypropylmethylcellulose, cellulose phthalate, methacryulic copolymer and shellac. An enteric coating may be employed, as well as coloring agents for identification, and if desired, the solid form may be polished with a waxy composition, such as carnuba wax.

[0019] The following example is for illustrative purposes and is not to be construed as limiting the invention. All parts are by weight unless otherwise specified.

Example 1

[0020] As shown in the schematic below, a mixture of calcium carbonate, pharmaceutical grade with maltodextrin BTH granulation; Vitamin D3 CSW, Cold Water Soluble, 100,000 I. U./g; cupric oxide, magnesium oxide, manganese sulfate, sodium borate·10 H_2O and sodium lauryl sulfate is blended for 5 minutes (Premix A).

[0021] Premix A is sandwiched with zinc oxide and the remainder of the calcium carbonate and blended for 10 minutes (Final Blend).

[0022] A 15% solid suspension coating is prepared by mixing pink film (Dusty Rose) coating premix, mineral oil, and sodium lauryl sulfate (Coating Solution Preparation).

[0023] The Final Blend is compressed into the desired dosage form.

[0024] The Coating Solution Preparation is applied to the solid dosage.

[0025] Listed below are the individual quantities of the ingredients preferred for the calcium, vitamin D, and multi-mineral dietary supplement formulation.

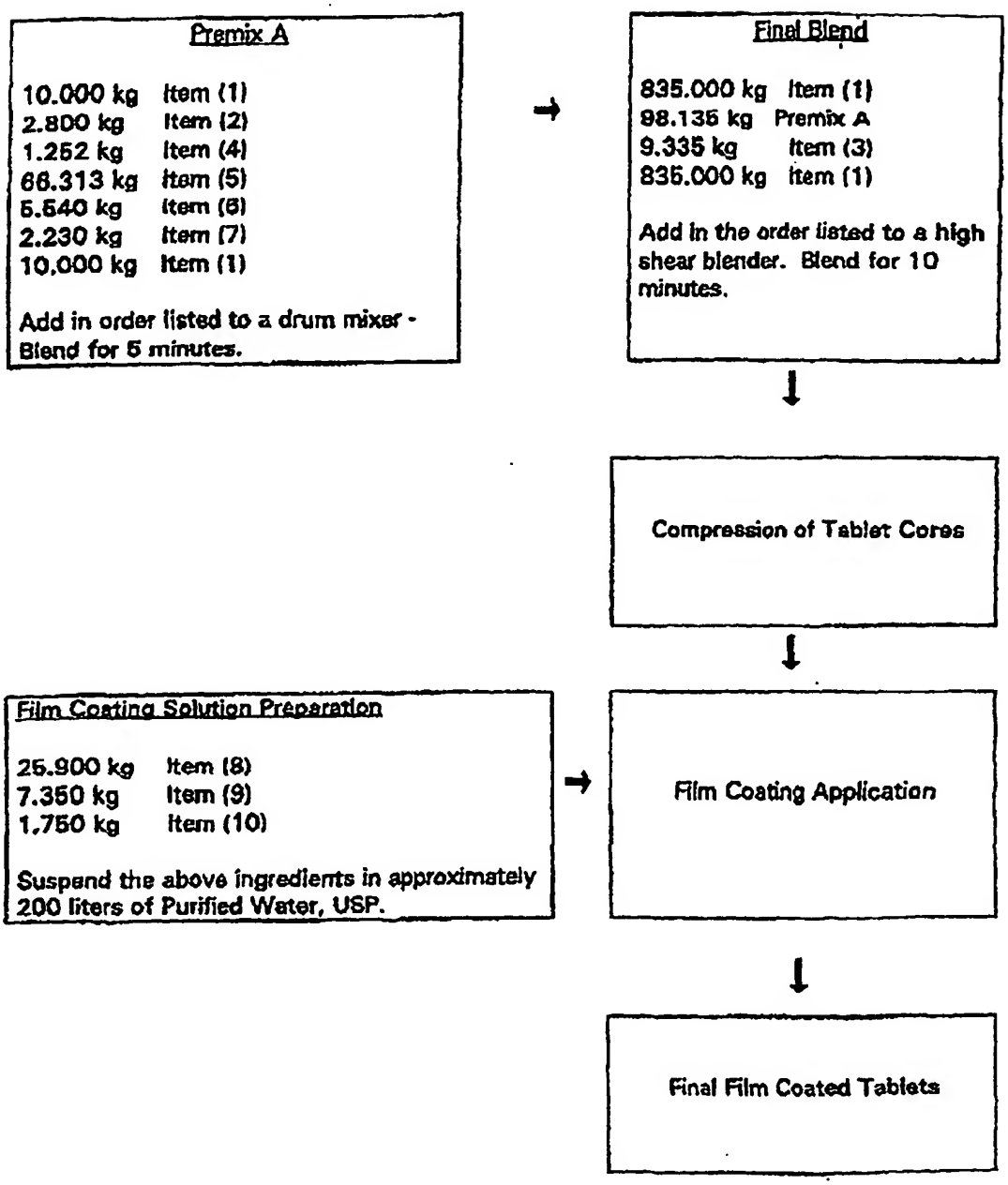
Raw Material	Label Claim per Dosage	Quantity of Raw Material per Dosage (g)
1. Calcium carbonate pharmaceutical grade w/ maltodextrin BTH granulation	600 mg Ca^{++}	1.690000
2. Vitamin D3 CWS 100,000 I. U./g	200 IU/D	0.002800

(continued)

Raw Material	Label Claim per Dosage	Quantity of Raw Material per Dosage (g)
3. Zinc Oxide	7.5 mg Zn	0.009335
4. Cupric Oxide	1.0 mg Cu	0.001252
5. Magnesium Oxide	40 mg Mg	0.066313
6. Manganese Sulfate	1.8 mg Mn	0.005540
7. Sodium Borate·10 H_2O	250mcg B	0.002230
8. Pink Film (Dusty Rose) Coating Premix		0.025900
9. Mineral Oil		0.007350
10. Sodium Lauryl Sulfate		0.001750
Total Table Weight		**1.812470**

[0026] The numbers shown in the schematic of the formulation, below, correspond to the raw material numbers above.

Schematic of Formulation



Claims

1. A dietary supplement composition to protect against bone loss comprising:

   calcium carbonate having a content of 1000 to 2500 mg;
   vitamin D having a content of 50 to 800 I.U.; and the following as minerals,
   a boron compound having a content of 50 to 3000 micrograms;

a copper compound having content of 0.1 to 5.0 mg;
a magnesium compound having a content of 10 to 150 mg;
a manganese compound having a content of 3 to 10mg; and
a zinc compound having a content of 3 to 25mg.

2. A dietary supplement composition as claimed in claim 1, which is in an oral solid dosage form selected from a tablet, a capsule, a lozenge, a chewable tablet and a bulk powder.

3. A dietary supplement composition as claimed in claim 1, which is in the form of a tablet.

4. A dietary supplement composition as claimed in any one of claims 1 to 3 in which the total weight of the dosage from is equal to or less than 2.0 grams.

5. A dietary supplement composition as claimed in any one of claims 1 to 3 in which the vitamin D is present within the range of 200 to 400 I.U.

6. A dietary supplement composition as claimed in any one of claims 1 to 5, in which the copper compound, magnesium compound, manganese compound and zinc compound contain anions selected from oxide, phosphate, chloride, sulfate and nitrate.

7. A dietary supplement composition as claimed in any one of claims 1 to 6, in which the calcium carbonate content is within the range of 1500 to 2000 mg.

8. A dietary supplement composition as claimed in any one of claims 1 to 7, which includes preservatives, food grade emulsifiers and pharmaceutically acceptable carriers and excipients.

Patentansprüche

1. Diätergänzungszusammensetzung zum Schutz gegen Knochenabbau, umfassend:

Calciumcarbonat mit einem Gehalt von 1000 bis 2500 mg;
Vitamin D mit einem Gehalt von 50 bis 800 I.E.; und die folgenden Mineralien,
eine Borverbindung mit einem Gehalt von 50 bis 3000 Mikrogramm;
eine Kupferverbindung mit einem Gehalt von 0,1 bis 5,0 mg;
eine Magnesiumverbindung mit einem Gehalt von 10 bis 150 mg;
eine Manganverbindung mit einem Gehalt von 3 bis 10 mg; und
eine Zinkverbindung mit einem Gehalt von 3 bis 25 mg.

2. Diätergänzungszusammensetzung nach Anspruch 1, welche eine orale feste Dosierungsform, ausgewählt aus einer Tablette, einer Kapsel, einer Pastille, einer kaubaren Tablette und einem losen Pulver, ist.

3. Diätergänzungszusammensetzung nach Anspruch 1, welche in Form einer Tablette vorliegt.

4. Diätergänzungszusammensetzung nach einem der Ansprüche 1 bis 3, worin die Gesamtmasse der Dosierungsform gleich oder geringer als 2,0 Gramm ist.

5. Diätergänzungszusammensetzung nach einem der Ansprüche 1 bis 3, worin das Vitamin D innerhalb des Bereiches von 200 bis 400 I.E. vorhanden ist.

6. Diätergänzungszusammensetzung nach einem der Ansprüche 1 bis 5, worin die Kupferverbindung, die Magnesiumverbindung, die Manganverbindung und die Zinkverbindung Anionen, ausgewählt aus Oxid, Phosphat, Chlorid, Sulfat und Nitrat, enthält.

7. Diätergänzungszusammensetzung nach einem der Ansprüche 1 bis 6, worin der Calciumcarbonatgehalt im Bereich von 1500 bis 2000 mg liegt.

8. Diätergänzungszusammensetzung nach einem der Ansprüche 1 bis 7, welche Konservierungsmittel, für Nah-

rungsmittel geeignete Emulgatoren und pharmazeutisch annehmbare Träger und Exzipienten beinhaltet.

Revendications

1. Composition de complément alimentaire en vue d'une protection vis-à-vis d'une perte osseuse comprenant : du carbonate de calcium en une quantité de 1000 à 2500 mg; de la vitamine D en une quantité de 50 à 800 U.I.; et la suite comme minéraux, un composé de bore en une quantité de 50 à 3000 microgrammes; un composé de cuivre en une quantité de 0,1 à 5,0 mg; un composé de magnésium en une quantité de 10 à 150 mg; un composé de manganèse en une quantité de 3 à 10 mg; et un composé de zinc en une quantité de 3 à 25 mg.

2. Composition de complément alimentaire suivant la revendication 1, qui est une forme posologique solide orale sélectionnée parmi un comprimé, une capsule, une pastille, un comprimé à mâcher et une poudre en vrac.

3. Composition de complément alimentaire suivant la revendication 1, qui est sous la forme d'un comprimé.

4. Composition de complément alimentaire suivant l'une quelconque des revendications 1 à 3, dans laquelle le poids total de la forme posologique est égal à ou inférieur à 2,0 grammes.

5. Composition de complément alimentaire suivant l'une quelconque des revendications 1 à 3, dans laquelle la vitamine D est présente dans la gamme de 200 à 400 U.I.

6. Composition de complément alimentaire suivant l'une quelconque des revendications 1 à 5, dans laquelle le composé de cuivre, le composé de magnésium, le composé de manganèse et le composé de zinc contiennent des anions sélectionnés parmi un oxyde, un phosphate, un chlorure, un sulfate et un nitrate.

7. Composition de complément alimentaire suivant l'une quelconque des revendications 1 à 6, dans laquelle la quantité de carbonate de calcium est dans la gamme de 1500 à 2000 mg.

8. Composition de complément alimentaire suivant l'une quelconque des revendications 1 à 7, qui comprend des conservateurs, des agents émulsionnants de qualité alimentaire et des vecteurs et excipients pharmaceutiquement acceptables.